

Reviewer Comment

Author Response

The authors applied a spatially referenced Bayesian state-space model to conduct an analysis on how in-lake (Erie) TP concentrations are affected by the adjacent river basin. In general, the paper is adequately written (this means that the authors could improve the manuscript to succeed a smoother experience for the reader) and I find their effort decent in terms of methodological analysis. The presentation of the results is satisfactory, with convincing explanations when needed.

GENERAL COMMENTS:

RIC1 Although that in introduction you speak about the absence of scientific investigation in correlating out-of-the lake and in-lake nutrient concentrations, I think that the authors must highlight their contribution better. For this reason, I propose to add some lines explaining your contribution to the methodology used and how this progresses science beyond the state-of-the-art

The authors propose adding text and an appropriate citation in **Section 1**.

“Our contribution to the ecological state space model methodology is incorporating a surface current derived adjacency matrix, combined disparate agency field data, and incorporate data from rivers as sources of information in fitting estimated values within a system dominated by missing values. Together our contribution will fit values in the absence of observations and allow experimentation in archival data previously not possible.”

RIC2 By applying the Bayesian methodology and using three different chains, in my opinion, you should speak about convergence. It is a prerequisite for the model used here.

We agree with this reviewer comment, thank you for pointing out the omission. The authors propose adding text and an appropriate citation in **Section 2.2.1** where we describe fitting the models.

“The chain convergence was monitored by Gelman and Rubin's convergence diagnostic. Scale factors less than 1.1 were used to define when chains had converged (Plummer, 2019).”

LINE-SPECIFIC COMMENTS:

RIC3 Line 32: I suggest to add one recent and very relevant reference after Schneider and Blaha, 2020: Mellios, N. K., Moe, S. J. and Laspidou, C.: Using Bayesian hierarchical modelling to capture cyanobacteria dynamics in Northern European lakes, Water Research, 186, 116356.

The authors will change the manuscript as suggested by the reviewer.

R1C4 Line 37: Please use 2 as superscript in km². Correct t throughout the manuscript.

The authors will change the manuscript as suggested by the reviewer.

R1C5 Line 65: My opinion is to erase "within".

The authors will change the manuscript as suggested by the reviewer.

R1C6 Line 66: Please use "it does not" instead of "it is does not".

Our copy of the original manuscript does not contain this error, potentially an extra character was inserted during the PDF-upload-conversion process. We will ensure that the error is not reproduced.

R1C7 Line 79: Please use "extend from" instead of "range from".

The authors will change the manuscript as suggested by the reviewer.

R1C8 Line 111: Please erase the "the".

The authors will change the manuscript as suggested by the reviewer.

R1C9 Line 188: Use "values" instead of "vales".

The authors will change the manuscript as suggested by the reviewer.

R1C10 Line 190: After "were collected" use ";" instead of comma in order to make the sentence smoother for the reader.

The authors will change the manuscript as suggested by the reviewer.

R1C11 Line 291: Please use "also" instead of "too".

The authors will change the manuscript as suggested by the reviewer.